

The Nutritive Processing of Moringa Oleifera

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Abstract:- *Moringa oleifera* Lam (Moringaceae) is a plant with high nutritional and medicinal value. Native to India, it is now widely distributed throughout tropical and subtropical regions of the world. Its different parts are sources of proteins, vitamins and minerals and present different pharmacological and biotechnological potential. Moreover, *M. oleifera* seeds are widely used in water and effluent treatment, for their coagulation, flocculation and sedimentation properties, their ability of improving water quality, by reducing organic matter and microbial load, with special applicability in intensive animal production systems, such as aquaculture. In addition, due to its high nutritional value and several medicinal properties, this tree may act as a nutritional and medical alternative for socially neglected populations. The leaves are rich in minerals, vitamins and other essential phytochemicals. Extracts from the leaves are used to treat malnutrition, augment breast milk in lactating mothers. It is used as potential antioxidant, anticancer, anti-inflammatory, antidiabetic and antimicrobial agent. *M. oleifera* seed, a natural coagulant is extensively used in water treatment. The scientific effort of this research provides insights on the use of moringa as a cure for diabetes and cancer and fortification of moringa in commercial products. In this context, this review involves information on *M. oleifera*, and its nutritive processing which ends up with instant soup powder.

Key Words: — *Moringa oleifera*, antimicrobial, antidiabetic, phytochemicals, malnutrition, natural coagulant.

I. INTRODUCTION

Moringa oleifera belonging to the family of Moringaceae is an effective remedy for malnutrition. Moringa is rich in nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. In fact, moringa is said to provide 7 times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, 15 times more potassium than bananas and 25 times more iron than spinach. The fact that moringa is easily cultivable makes it a sustainable remedy for malnutrition. Countries like Senegal and Benin treat children with moringa. Children deprived of breast milk tend to show symptoms of malnutrition. Lactogogues are generally prescribed to lactating mothers to augment milk production. The lactagogue, made of phytosterols, acts as a precursor for hormones required for reproductive growth. Moringa is rich in phytosterols like stigmasterol, sitosterol and kampesterol which are precursors for hormones. These compounds increase the estrogen production, which in turn stimulates the proliferation of the mammary gland ducts to produce milk. It is used to treat malnutrition in children younger than 3 years. About 6 spoonfuls of leaf powder can meet a woman's daily iron and calcium requirements, during pregnancy. Here the

ideology is so simple, we have seen many nutritional powders for an infant to all age group people. By considering the nutritional effects that moringa oleifera have on us, we decided to make it out into an instant soup powder for this fast moving world which has no time for their own health conscious.



Fig.1. *Moringa oleifera*

II. PLANTATION AND SOIL CONDITION

M. oleifera can be grown in any tropical and subtropical regions of the world with a temperature around 25–35 °C. It requires sandy or loamy soil with a slightly acidic to slightly alkaline pH and a net rainfall of 250–3000 mm. The direct seeding method is followed as it has high germination rates. Since moringa seeds are expected to germinate within 5–12 days after seeding and can be implanted at a depth of 2 cm in the soil. Moringa can also be propagated using containers. The saplings are placed in plastic bags containing sandy or loamy soil. After it grows to about 30 cm, it can be transplanted. However, utmost care has to be taken while transplanting as the tap roots are tender and tend to get affected. The tree can also be cultivated from cuttings with 1 m length and 4–5 cm in diameter, but these plants may not have a good deep root system. Such plants tend to be sensitive to drought and winds. For commercial purposes large scale intensive and semi-intensive plantation of moringa may be followed. In commercial cultivation, spacing is important as it helps in plant management and harvest. *M. oleifera* differs in nutrient composition at different locations. The tree grown in India has slightly different nutritional components than a tree grown in Nigeria. Asante et al studied the nutritional differences in the leaves from two ecological locations semi-deciduous and Savannah regions. It showed that the latter was less nutritious than the former and attributed this to high temperatures at the Savannah regions. At higher temperature, proteins and enzymes get denatured and this could be the cause for the difference in nutrient content.

Soil is an important factor that defines nutrient content and strength of the plant. Dania et al showed that fertilizers when applied solely or in combination with others resulted in different nutrient compositions on plant parts. NPK fertilizer, poultry manure and organic base fertilizer was provided to study the effect on the nutrient content and found that poultry manure gave the best results than phosphorous, potassium, sodium and manganese. Likewise the stem girth and vegetative growth of moringa increased on application of poultry manure. The overall nutrient attributes of the plant remain same albeit nutrient variability. This makes moringa viable as a potential nutraceutical anywhere in the world.

III. NUTRITIONAL PROPERTIES

Every part of *M. oleifera* is a storehouse of important nutrients and antinutrients. The leaves of *M. oleifera* are rich in minerals like calcium, potassium, zinc, magnesium, iron and copper. Vitamins like beta-carotene of vitamin A, vitamin B such as folic acid, pyridoxine and nicotinic

acid, vitamin C, D and E also present in *M. oleifera*. Phytochemicals such as tannins, sterols, terpenoids, flavonoids, saponins, anthraquinones, alkaloids and reducing sugar present along with anti-cancerous agents like glucosinolates, isothiocyanates, glycoside compounds and glycerol-1-9-octadecanoate. Moringa leaves also have a low calorific value and can be used in the diet of the obese. The pods are fibrous and are valuable to treat digestive problems and thwart colon cancer. A research shows that immature pods contain around 46.78% fiber and around 20.66% protein content. Pods have 30% of amino acid content, the leaves have 44% and flowers have 31%. The immature pods and flowers showed similar amounts of palmitic, linolenic, linoleic and oleic acids.

Moringa has lot of minerals that are essential for growth and development among which, calcium is considered as one of the important minerals for human growth. While 8 ounces of milk can provide 300–400 mg, moringa leaves can provide 1000 mg and moringa powder can provide more than 4000 mg. Moringa powder can be used as a substitute for iron tablets, hence as a treatment for anemia. Beef has only 2 mg of iron while moringa leaf powder has 28 mg of iron. It has been reported that moringa contains more iron than spinach. A good dietary intake of zinc is essential for proper growth of sperm cells and is also necessary for the synthesis of DNA and RNA. *M. oleifera* leaves show around 25.5–31.03 mg of zinc/kg, which is the daily requirement of zinc in the diet.



IV. PRESERVATION AND DOSAGE LEVEL

Moringa can also be preserved for a long time without loss of nutrients. Drying or freezing can be done to store the leaves. A report by Yang et al shows that a low temperature oven used to dehydrate the leaves retained more nutrients except vitamin C than freeze-dried leaves. Hence, drying can be done using economical household appliance like stove to retain a continuous supply of nutrients in the leaves. Preservation by dehydration improves the shelf life of Moringa without change in nutritional value.

An overdose of moringa may cause high accumulation of iron. High iron can cause gastrointestinal distress and hemochromatosis. Hence, a daily dose of 70 g of moringa is suggested to be good and prevents over accumulation of nutrients.



V. METHODOLOGY

A. Ingredients needed

- Dried Moringa leaves
- Dried white pepper
- Rice krispies
- Rolled oats
- Dried onion flakes
- Jeera for flavor
- Cumin seeds
- Dried tomatoes and garlic cloves
- Dried Coriander leaves

B. Process

Sun drying: Weigh accurately 200 g of the drumstick leaves for sun drying process. In this method the fresh drumstick leaves washed and air dried for few minutes then put on the filter paper. Filter paper with tray placed at a place where adequate amount of sunlight available.

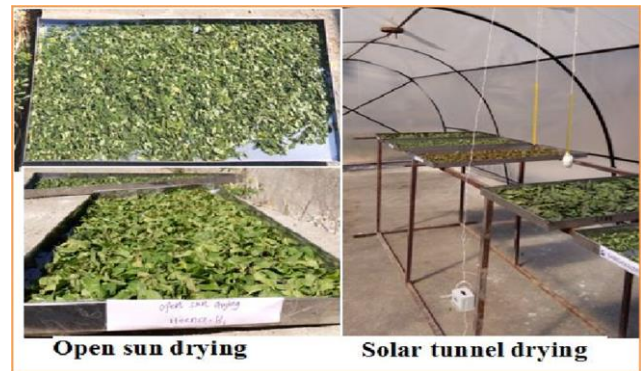


Fig. 2. Moringa Drying

C. Grinding of moringa leaves

Dried moringa leaves are placed in a high speed crusher. It is a hammer type high-speed crusher. The material is broken into the crushing chamber by the hopper through the screw conveying rod, and is broken by the high-speed rotating hammer.

The crushed spice powder is automatically entered into the trapping bag by rotating centrifugal force, and the dust is filtered and recovered by the bag through the suction box.



Fig.3. Crushing machine



Fig.4. Crushed Powder

D. The Mix of Ingredients

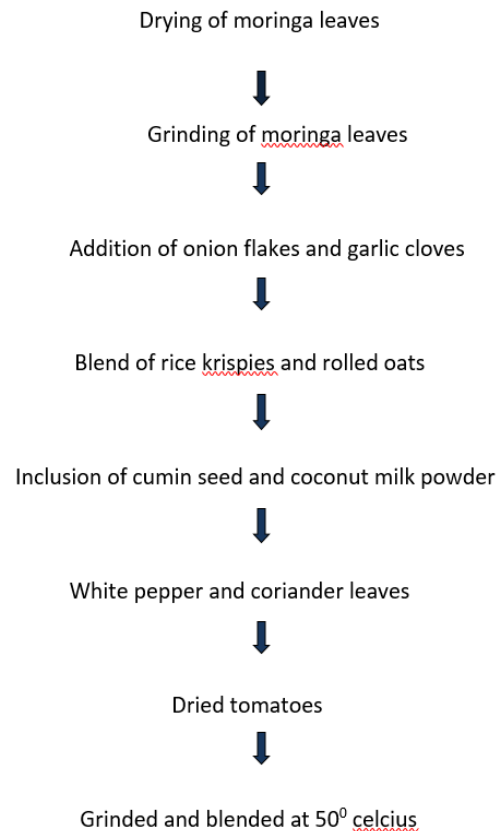
- Obviously dried moringa leaves can have bitterness with them. its bitterness can be removed or pacified during further processing of soup powder.
- Dried onion flakes and garlic cloves are added to enhance the flavour.
- The blend of Rice krispies and rolled oats gives good mouth feel while consuming.
- Addition of dried cumin seed and coconut milk powder gives extra nourishing flavour to the soup mix.
- To the spicy part of the soup we add some white pepper which has extreme health effects along with dried coriander leaves to give refreshing flavour.
- Dried tomatoes which has unique combination of five tastants is added in the list to give extra peppiness to the soup flavour.
- All these ingredients are taken in assorted amounts are roasted without oil and grinded together with a pinch of salt.
- Hence the grinded ingredients are now mixed together with appropriate amount of grounded moringa leaves. thus the instant nutritivesoup powder is ready to consume and most notably it is free from additives.
- All these stuffs are dried, roasted, and grinded under 50⁰ degree celcius. because exposure to high temperature can cause nutritional loss.

- All that consumer has to do is transfer the instant soup mix into a bowl. boil water for up to 100⁰ degree celcius and pour it into the bowl containing soup mix and stir for 2 minutes until the entire content dissolves. And the soup is ready to consume.



Fig.5. Soup Mix

E. Overall diagram



F. Benefits of moringa leaves

Moringa has many important vitamins and minerals. The leaves have 7 times more vitamin C than oranges and 15 times more potassium than bananas. It also has calcium, protein, iron, and amino acids, which help your body heal and build muscle. It also cures diabetes, asthma, anemia and helps in weight loss.



MORINGA POWER™
"TREE OF LIFE"
 Tiny leaf, **HUGE** power!

Helps to prevent over 300 diseases!

- Libido Supporter
- Impotency
- Anti-Depressant
- Weight Loss
- Antioxidant
- Colitis
- Detoxification
- Stimulates Hair Growth
- Herbal Laxative
- Increased Mental Clarity
- UTI
- Premature Ageing
- Increased Energy
- Anti-Tumor
- Anaemia
- Osteoporosis
- Immune System
- Arthritis
- Anti-inflammatory

2 x MORE VITAMIN A THAN CARROTS
 14 x MORE CALCIUM THAN MILK
 4 x MORE FIBRE THAN OATS
 4 x MORE POTASSIUM THAN BANANAS
 9 x MORE IRON THAN SPINACH
Gram per Gram Comparison

Fig.6. Powder as an anti-inflammatory

G. Benefits of other ingredients

White pepper works best for those suffering from loss of appetite as it enhances appetite and promotes healthy gut. The spice helps to get rid of secretions from airways. It is also used to treat constipation as it supports large intestine peristalsis and accelerates metabolism.



Fig.7. White pepper

The active medicinal substances in the onion are vitamin C for rotting and tonic and the substance Clokinin, which is like insulin control blood sugar, so onions are using medicines for diabetics, and there is onion sulfur, iron, and vitamins strengthens the nerves.



Fig.8. Clokinin

The use of garlic powder reduces the buildup of plaque in the arteries. This, in turn, helps keep blood pressure down. You lower your risk of cardiovascular diseases.



Fig.9. Garlic

Garlic powder has a wealth of minerals and antioxidants that help boost immunity. Taking garlic powder regularly gives you protection from viruses, fungi, and bacteria. It keeps you free from infections. It helps reduce your risk of several serious health conditions, including atherosclerosis, diabetes, cancer, and cardiovascular disease.

Coconut milk powder is a magical food that enhances the vitality and endurance of the body. It reduces muscle fatigues and also broken, and tired ligaments lack of proper supply of oxygen do not have enough oxygen. It also helps to trigger muscle fatigue and pain. Coconut milk powder provides the best oxygenation to all parts of the body. It rises the fresh oxygen supply to damage and tired muscles and tissues. This results in a rapid recovery.



Fig. 10. Coconut Milk

Cumin aldehyde, thymol and phosphorus are components of cumin that serve as good detoxifying agents



Fig.11. Cumin

The nutrient composition of oats is well-balanced. They are a good source of carbs and fiber, including the powerful fiber beta-glucan (1Trusted Source, 2Trusted Source, 3Trusted Source).They also contain more protein and fat than most grains (4Trusted Source).Oats are loaded with important vitamins, minerals and antioxidant plant compounds.



Fig12. Oats

This rice krispies is very low in Saturated Fat and Cholesterol. It is also a good source of Vitamin C and Manganese, and a very good source of Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12 and Iron.



Fig13. Rice krispies

Dried tomatoes: These little gems are packed with **nutrients** and anti-oxidants (including lycopene) that are event believed to decrease the risk of certain cancers, neutralize free radicals and decrease inflammation.



Fig.14. Sun-dried tomatoes

Coriander stimulates digestive enzymes and juices, which are known to enhance our digestive system. They are a good source of fibre too.



Fig.15. Coriander

VI. CONCLUSION

The nutritional content of each and every product is well analysed and balanced. The iron content of the final product is concerned and calculated not to extend the required intake limit. Therefore, the instant nutritive moringa soup will be a best starter of your meal.

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